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Hybridization of improved technology with indigenous technical knowledge (ITK) for improvement of Muga cocoon yield

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Abstract
Muga culture has immense potentiality for socio-economic upliftment with sustainable income generation amid rural folk in North East India. Muga silkworm is reared on Som (*Persea bombycina)* and Soalu (*Litsea polyantha*) plants for production of muga cocoons. In order to ensure crop production, traditional farmers used diverse indigenous technical knowledge (ITK) in the farming process of muga culture. The plant *Litsea salicifolia* is locally named as Dighloti in Assam and known as secondary host plants of muga silkworm. 'Early stage muga silkworm rearing at Dighloti' is one of the important ITK used by the traditional farmers for silkworm diseases management. With the aim of validate the efficiency of the ITK, five consecutive crops of muga silkworm were conducted using the ITK hybridized with the existing improved technology packages. The study revealed that extent of incidence of muga silkworm disease was 6.4 percent in ITK hybridized improved technology against 14.4 percent in existing improved technology package. Thus, average yield of 70 cocoon per dfl and ERR 62.2 percent was significantly higher in ITK hybridized improved technology as compared to the yield of 56 cocoons per dfl and ERR 51.7 percent in improved technology package.

Keywords: Muga culture, indigenous technical knowledge (ITK), improve technology, effective rate of rearing, silkworm disease.

Introduction
Muga silkworm (*Antheraea assamensis*, Helfer), a semi domesticated multivoltine insect belongs to order Lepidoptera and family Saturniidae generally reared on primary host plants Som (*Persea bombycina)* and Soalu (*Litsea polyantha*). The silkworm produces unique golden coloured silk called *'Muga Silk'* which is more durable and has great valued in the global market. Muga culture is a traditional practice in Assam and adjoining states of North East India and it involves lot of indigenous technical knowledge (ITK) based on long experience of the farmers over the time. Indigenous knowledge has enormous importance in different fields of agriculture including sericulture. Buresh and Cooper (1999) [5] defined indigenous technical knowledge as consisting of facts, experiences, practices, resource management strategies and production systems developed through trial-and-error during several millennia in a given community, nation or region. Anyira (2010) [1] opined that agriculture indigenous knowledge (AIK) offers great opportunities for improved agricultural production and sustainable food security. Warren (1991) [14] noted that AIK has made a tremendous contribution to crop production by poor farmers. Atte (1989) [2] enlightened that indigenous technical knowledge is the knowledge of a given population that reflects the experiences based on their tradition. The traditional muga farmers commonly used ITK in selection of healthy brood, silkworm rearing and seed production, pests and diseases management of silkworm, stifling of cocoons, reeling, etc (Bhattacharya, *et al* 1992, Phukon, *et al* 2006 and Dutta, *et al* 2009 and Mech, *et al* 2015) [4, 10, 7, 13]. However, in-spite of having immense importance of ITKs, adequate research and development efforts has yet to be focused on muga culture. The upliftment of socio-economic condition of the muga farming communities is likely to be almost impossible without the rich tradition of ITKs. *Litsea salicifolia* is a shrub plants locally named as Dighloti in Assam and known as secondary host plants of muga silkworm. The plant is abundant in Assam and other states of North East India. Traditionally, the plants are used for brushing of newly hatched muga silkworms and it is believed that muga silkworm fed on Dighloti leaves at the early stages (1st to 3rd instars), cocoon yield is enhanced. However, no study was conducted earlier to validate the practice scientifically. Hence, the present study was carried out to know the effectiveness of the ITK (early stages muga silkworms rearing at Dighloti) in terms of muga cocoon yield in different crop seasons.

Materials and methods

In order to assess the crop performance of the ITK, early stages muga silkworms (1st to 3rd instars) was reared at Dighloti plants and late stages (4th & 5th instars) at som plants in five consecutive crops during the year 2018-19. Based on the existing improved technology package, disease free laying (dfl) was used and rearing field was disinfected using lime and bleaching powder prior to one week of brushing silkworm. The som plants were pruned according to the crop schedule for production of quality leaves to rear late stage silkworm. Dighloti plants used for rearing of early stages silkworms were covered under nylon net to protect silkworms from its pest and predators. At the same time, muga silkworm rearing was conducted at som plants from 1st to 5th instars using the improved technology package to compare the crop performance of ITK hybridized improved technology and improved technology package. In each crop seasons, 10 replications were maintained in both cases. Crop performance especially extent of pests and diseases incidence of silkworm, cocoon yield per dfl and effective rate of rearing (ERR) were observed separately in ITK hybridized improved technology and improved technology package. Data were analyzed statistically using‘t-test’ and descriptive statistics for drawing inference.

Result and Discussion

From the table 1, it is evident that extent of incidence of muga silkworm disease in five consecutive crops was less in ITK hybridized improved technology (Av. 6.4%) in comparison improved technology package (14.4%). As a result, average cocoon yield (70 cocoons/dfl) and effective rate of rearing (62.2%) was increased in ITK hybridized improved technology as compared to average cocoon yield (56 cocoons/dfl) and effective rate of rearing (51.7%) in improved technology. In consecutive tables and figures, crop wise disease incidence, cocoon yield per dfl and effective rate of rearing (ERR) are shown along with bar graphs respectively. The ‘t-test’ of extent silkworm disease incidence, cocoon yield per dfl and effective rate of rearing (ERR) was significant at 1% level of significance which indicates the significant difference between ITK hybridized improved technology and improved technology package.

Muga Silk comes under ‘Vany Silk’ is the pride of Assam and is an integral part of the tradition and culture of the State. The silkworms is reared in outdoor and they are highly susceptible to various bacterial, viral, fungal and protozoan diseases. In improved technology package of muga culture, pruning of plants according to the crop seasons, disinfection of rearing field before brushing of silkworm, use of disease free layings (dfl), brushing of silkworm under nylon net, etc are primarily recommended to minimize the crop loss in muga culture (Chakravorty *et al*. 2005 and Rajan and Hazarika 2012). However, proper control measures of viral and bacterial diseases of muga silkworms are yet to be recommended. Traditionally, some of the muga farmers particularly in Upper Assam, Dighloti (*L. salicifolia*) plants are used for brushing of newly hatched muga silkworms. Farmers believed that muga silkworm fed on Dighloti leaves in its early stages (1st to 3rd instars), intensity of silkworm disease is reduced. This may be due to presence certain chemical component in Dighloti leaves that have antimicrobial properties and act to reduces diseases of silkworms. Various study revealed that due to possess of antibacterial properties, 'Dighloti' has been a part of traditional medicine systems in North East India from ancient time. The Apatani people of Ziro valley in Arunachal Pradesh are known to use the fruit of *L. salicifolia* in the treatment of bone fracture and stomach disorder (Kala C.P 2005) [8]. The leaves of *L. salicifolia* possess potent antibacterial activity and are able to kill bacteria involving generation of ROS induced oxidative stress (Kalita *et al* 2016) [9]. Rastogi and Borthakur (1980) [12] isolated two alkaloids dicentrinone and nordicentrine having antibacterial activity from leaves of *L. salicifolia*.

From the present study, it was revealed that the ITK (early stages muga silkworms rearing at Dighloti plants) is effective for higher yield of cocoon as well as ERR, reducing the incidence of silkworm disease to a considerable extent. Therefore, improvement of muga cocoon yield as well as ERR could be possible through hybridization of ITK with improved technology package in muga culture. However, further investigations on active ingredients of *L. salicifolia* leaves and its mode of action on silkworm disease pathogens is needed for effective control of microbial diseases of muga silkworms.

Table 1: Mean performance of muga silkworm crops under ITK with improved technology and improved technology

Crop season	Practices	Observations	Dfls (g)	Hatch-ing. (%)	Worms brushed (Nos	Incidence of disease (%)	Incidence of pest (%)	Other loss (%)	Total cocoon produced (Nos)	Cocoon/dfl (Nos)	ERR (%)
Feb-Mar	ITK with improved technology	10	10	85.0	1215	6.1	13.9	20.7	720	72	59.3
	Improved technology	10	10	70.0	1001	12.7	15.1	20.0	523	52	52.2
Apr-May	ITK with improved technology	10	10	90.0	1287	7.1	14.2	25.0	690	69	53.7
	Improved technology	10	10	90.0	1287	12.5	15.0	25.0	610	61	47.5
Aug-Sep	ITK with improved technology	10	10	70.0	994	6.8	15.4	13.4	640	64	64.4
	Improved technology	10	10	70.0	994	21.3	16.1	19.3	430	43	43.3
Oct-Nov	ITK with improved technology	10	50	80.6	5642	5.9	10.0	16.7	3803	76	67.4
	Improved technology	10	50	79.6	5572	14.0	10.6	18.0	3196	64	57.4
Dec-Jan	ITK with improved technology	10	50	75.0	5325	6.0	11.2	16.6	3525	71	66.2
	Improved	10	50	75.0	5325	11.7	12.6	17.8	3083	62	57.9

	technology										
Average	ITK with improved technology	**10**	**26**	**80.1**	**2893**	**6.4**	**13.0**	**18.5**	**1875.6**	**70**	**62.2**
	Improved technology	**10**	**26**	**77.0**	**2836**	**14.4**	**13.9**	**20.0**	**1568.4**	**56**	**51.7**

Table 2: t-Test of muga silkworm disease incidence in ITK hybridized improved technology with improved technology

Crops Seasons	Practices	N	Mean	df	t -Stat	P(T<=t) two-tail	t Critical two-tail
Feb-Mar	ITK with improved technology	10	6.1	18	-7.43	6.90E-07**	2.10
	Improved technology	10	12.7				
Apr-May	ITK with improved technology	10	7.1	18	-1.14	1.18E-06**	2.10
	Improved technology	10	12.5				
Aug-Sep	ITK with improved technology	10	6.8	18	-16.02	4.25E-12**	2.10
	Improved technology	10	21.3				
Oct-Nov	ITK with improved technology	10	5.9	18	-8.24	1.59E-07**	2.10
	Improved technology	10	14.0				
Dec-Jan	ITK with improved technology	10	6.0	18	-6.55	3.71E-06**	2.10
	Improved technology	10	11.7				

** Significant at 1% level

Table 3: t-Test of muga cocoon yield per dfl in ITK hybridized improved technology with improved technology

Crops	Practices	N	Mean	df	t Stat	P(T<=t) two-tail	t Critical two-tail
Feb-Mar	ITK with improved technology	10	72	18	15.88	4.92E-12**	2.10
	Improved technology	10	52				
Apr-May	ITK with improved technology	10	69	18	7.31	8.51E-07**	2.10
	Improved technology	10	61				
Aug-Sep	ITK with improved technology	10	64	18	28.17	2.43E-16**	2.10
	Improved technology	10	43				
Oct-Nov	ITK with improved technology	10	76	18	2.08	4.18E-05**	2.10
	Improved technology	10	64				
Dec-Jan	ITK with improved technology	10	71	18	4.96	0.0001**	2.10
	Improved technology	10	62				

** Significant at 1% level

Table 4: t-Test of ERR in ITK hybridized improved technology with improved technology

Crops	Practices	N	Mean	df	t Stat	P(T<=t) two-tail	t Critical two-tail
Feb-Mar	ITK with improved technology	10	59.3	18	6.20	7.37E-06**	2.10
	Improved technology	10	52.2				
Apr-May	ITK with improved technology	10	53.7	18	7.31	8.51E-07**	2.10
	Improved technology	10	47.5				
Aug-Sep	ITK with improved technology	10	64.4	18	28.67	1.78E-16**	2.10
	Improved technology	10	43.2				
Oct-Nov	ITK with improved technology	10	67.4	18	5.41	3.81E-05**	2.10
	Improved technology	10	57.4				
Dec-Jan	ITK with improved technology	10	66.2	18	4.96	0.0001**	2.10
	Improved technology	10	57.9				

** Significant at 1% level

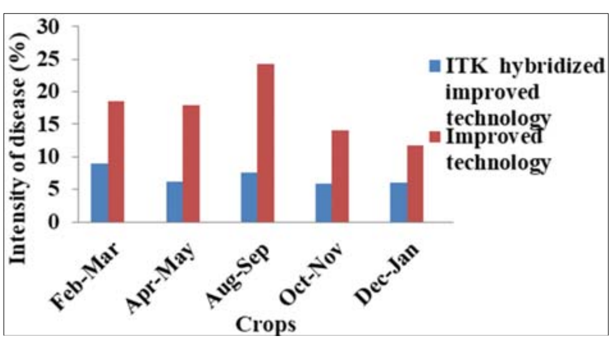

Fig 1: Disease incidence of silkworm

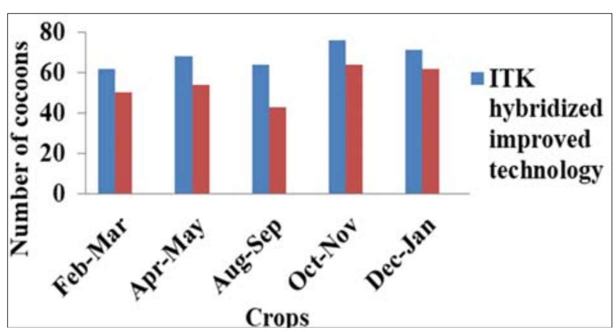

Fig 2: Cocoon /dfl

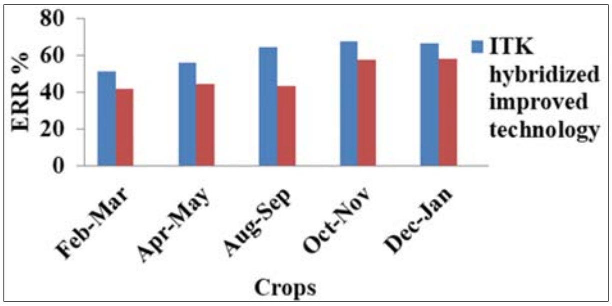

Fig 3: ERR

Conclusion

The present study inferred that hybridization of ITK (early stages muga silkworms rearing at Dighloti) with improved technology package is useful for considerable improvement of crop performance by reducing silkworm disease intensity. Therefore, sufficient augmentation of *L. salicifolia* as food plants of muga silkworms is needed to be popularized by the extension workers of the concerned government agencies. Besides, importance of Dighloti plants in muga culture need to be passed on to the entire muga farming community through awareness and demonstration of technology. At the same time, further investigations on active ingredients of *L. salicifolia* leaves and its mode of action on silkworm disease pathogens is need to initiated for effective control of microbial diseases of muga silkworms.

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References

1. Anyira Isaac. The role of libraries in the preservation and accessibility of indigenous knowledge in the Niger Delta Region of Nigeria. Library Philosophy and Practice, 2010. Available at htpp:/www.faqs.org/ periodicals/ 201006/ 2095013311. html.
2. Atte OD. Indigenous local knowledge as a key to local level development: possibilities, constraints and planning issues in the Continent of Africa. Paper presented at the seminar on reviving local self- reliance. Challenges for Rural/ Regional Development in eastern and southern Africa. Arusha Feb, 1989, 21-24.
3. Barah A, Mech D, Hazarika U, Chakravorty R. Crop stabilization in muga culture. Sericologia. 2006; 46(4):423-431.
4. Bhattacharya A, Saikia SK, Goswami D, Das PK. Traditional Practices and scientific validity of muga cultural practices. Indian Silk, 1992.
5. Buresh RS, Cooper PSM. The Science and Practice of Short-Term Improved Fallows. Symposium Synthesis and Recommendations. Agro forestry System. 1999; 47:345-356.
6. Chakravorty R, Barah A, Neog K, Rahman SAS, Ghose J. Package of practices of muga, eri and mulberry sericulture for North Eastern region of India, CMER&TI, CSB, Lahdoigarh, Jorhat, Assam, 2005.
7. Dutta P, Das K, Das R, Mech D, Chakravorty R. Pest and disease management in muga Culture: Traditional Practices - Indian Silk. 2009; 47(9)1:6-18.
8. Kala CP. Ethnomedicinal botany of the apatani in the Eastern Himalayan region of India. J Ethnobiol Ethnomed. 2005; 1:1-8.
9. Kalita N, Kalita MC, Banerjee M. Reactive oxygen species generation in the antibacterial activity of *Litsea salicifolia* leaf extract. Int. J Pharm Pharm Sci. 2016; 8(8):189-193.
10. Phukon R, Chowdhuri SN. Traditional knowledge and practices involves in muga culture of Assam: Indian Journals of Traditional Knowledge. 2006; 5(4):450-453.
11. Rajan RK, Hazarika U. Constraints in muga culture-stretagies and research programme undertaken at CMER&TI, Lahdoigarh, National Seminar on Recent trends in Research & Development in Muga Culture – ideas to action, Guwahati, 2012, 125-131.
12. Rastogi RC, Borthakur N. Alkaloids of *Litsea laeta* and *L. salicifolia*. Phytochemistry. 1980; 19:998-9.
13. Mech D, Ahmad M, Kumar R. **“**Indigenous Technical Knowledge Associated in Muga culture”, Biological Forum – An International Journal. 2015; 7(1):1-6.
14. Warren DM. Indigenous Agricultural Knowledge Systems and Development. Agriculture and Human Values, 1991, 8(1-2).
15. Merit. Similarly length at 95 DAS, number of nodes at 95 DAS, number of branches at 45 DAS were the good general combiners.